



Research Paper

Optimizing Total Value Chain Margin in Shrimp Commodity Through Improvement of Supply Chain Design

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ABSTRACT : *The research focuses on the disparity between the export price of frozen vannamei shrimp and the prevailing market pricing (the gap around \$1.3 - \$2.4), which is mostly influenced by the products offered by Indian and Ecuadorian enterprises in 2023. Consequently, the company's insufficient competitiveness hinders its ability to effectively participate in the American shrimp export market. The research aims to assess the components of the commodity value chain that impact competitiveness, cost reduction, and profit growth. Subsequently, it is employed as a substance for suggesting strategy and enhancements to the design of the supply chain.*

The research employed the Delphi qualitative approach, which involved conducting expert interviews utilizing Porter's theory of industry analysis and value chain, along with the application of the VRIN model for competitive advantage measurement. The research findings revealed that there are seven factors that have an impact on competitiveness: Upstream strategy integration, export license certification, cultivation technical support, digitalization of supply chain and traceability, delivery of fresh shrimp within 10 hours, downstream integration strategy, and anticipation of price volatility. There are three high contribution cost structures in the supply chain: the cost of acquiring raw materials, the cost of manufacturing, and the potential margin loss in downstream distribution. Supply chain design enhancements were implemented in four different scenarios based on the specific conditions of the region in Indonesia. Consequently, the proposed design can be a decrease in costs of around 21-35% and an increase in profit margins of 8-22%. Scenario four is the supply chain design that yields the most optimum outcomes. The scenario is to integrate the self-development of ponds with the cultivation contract system in order to achieve cost-effective and high-quality shrimp supply. This involves implementing cultivation technology to enhance productivity, ensuring that fresh shrimp yields are promptly delivered to our own factory within 10 hours, and directly sending frozen shrimp to affiliated companies for distribution to consumers.

KEYWORDS: *Vannamei Shrimp Export, Value Chain analysis, Supply Chain Design*

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I. INTRODUCTION

Indonesia's export of vannamei shrimp has emerged as a prominent global commodity. Indonesia ranks among the top 5 exporters, with a total volume of 241,000 tons, which is lower than that of Ecuador, India, and Vietnam. Indonesia's primary export destination is the United States, accounting for around 70% of its total exports. In 2021, the volume of exports amounted to 174,536 tons, while in 2022, it reached 166,954 tons. This represents around 20% of the total market share, with India and Ecuador holding the greatest market shares at 37% and 24% respectively. A fisheries startup in Indonesia that operates in the fisheries cultivation ecosystem have a vision to expand their business in export market, especially to the US. Currently, in piloting to enter the export market, the selling price of the commodities offered is still too high around \$1.3 to \$2.7, compared to the market price and competitors. Mostly, the shrimp cultivation expenses are less competitive compared to India and Ecuador, impacting to the high raw material cost. The rising supply chain costs, which encompass middleman, logistics, warehousing, handling expenses, and downstream cost are progressively impeding the competitiveness

of the shrimp price. The spread of ponds and long distance to the processor, in comparison to those in Ecuador and India that more centralize pond and processor, is one of the contributing factors to this loss.

According to that business issue, the proposed research questions need to be answer are:

1. What aspect that currently influence along the value chain that will reducing the cost, build competitive advantage and potentially adding the margin?
2. What the recommendation to improve supply chain on current condition that give optimizing total value chain margin? If there some scenario of design, what design that the best to be implemented?
3. What aspect that will be the risk and what the scenario to mitigate the risk?

The objective of the research are:

1. Mapping and analyze key important aspect that influence the value chain in terms of cast and margin
2. Improve current supply chain design that optimize total value chain margin
3. Identify risk and mitigation plan

II. LITERATURE REVIEW

2.1 Theoretical Foundation

This research is guided by several theories, particularly the fundamental theory of value chain analysis, which plays a crucial role in determining a company's competitive advantage. Additionally, an examination was conducted on prior research to identify the appropriate conceptual framework by utilizing methodologies and factors that have been validated in past studies to assess and enhance supply chain models. Table 1 provides an explanation of the theoretical principles utilized in study and their respective contributions to the research.

Table 1. Theoretical Foundation

Theory	Description	Contribution to The Research
Porter five forces industry assessment	Assessing company's industry and competitive environment based on porter 5 forces aspect: bargaining power of buyer, bargaining power of supplier, threat of new entrance/ barrier to entry, threat of substitute, and competitiveness among current player/seller.	Using this framework to assess industry attractiveness, condition among 5 forces aspect, and critical point to success in this industry.
Porter value chain and VRIN analysis	Organization should add value to the service and products that the organization produces, and all these activities should be run at all level organization to gain any real competitive advantage. It also emphasized the importance of cost leadership, differentiation, and market focus (Porter, 1985). VRIN is an acronym that stands for Valuable, Rare, Inimitable, and Non substitutable, serving as a convenient reminder. The initial two assessments ascertain the capacity of a resource or capability to provide a competitive edge. The final two factors decide whether the competitive advantage can be maintained in the long term	Using Porter's framework to identify which variable along supply chain that impact to value or being sustainable competitive advantage. Identified cost and margin structure.
Aquaculture contract farming	Contract farming is agricultural production that is based on an agreement between a buyer and farmers that specifies requirements for the production and distribution of a farm product or goods (Zainol, Abas, Arifin, 2016)	Contract farming as model integration upstream to downstream that could elaborate as part of supply chain model.
Supply Chain integration strategic model	There is four types of integrations: backward vertical, forward vertical, horizontal, and conglomerate integration.	Using the integration strategy to formulate model and scenario of supply chain
Network optimization model in supply chain	The framework to evaluate and optimize supply chain based on strategic, tactical, and operational analysis using territorial approach.	Using framework to generate scenario and design option.
Supply chain operation reference (SCOR) model	SCOR model with risk agents identified 14 risk events and 19 risk agents that need to overlook along supply chain (Thuy, Chau, Phong, Tham, 2023)	Identify risk and potential problem in the future. Analysis mitigation plan for recommended supply chain model

2.2 Conceptual Framework

This thesis employs the thinking framework in figure 1 to address the research objectives. Conceptually, the first approach involved situational and value chain margin analysis. It will conduct this portion of the analysis using stakeholder analysis, Porter's 5 forces, Porter's value chain, and VRIN analysis. It adapted those theoretical

frameworks to the unique context of the vannamei shrimp aquaculture sector. It hopes that this analysis will reveal the market's attractiveness, the aspects and parameters influenced by the competitive advantage, potential cost reduction, and margin generation.

The second approach is to analyse the current supply chain design and recommend an improvement based on competitiveness parameters and potential margin improvement criteria. It conducts analysis at strategic, tactical, and operational territory area levels, considering some of the best practices from expert field learning, other research, and reliable information sources. In this section, we must provide a detailed explanation of how the integration strategy can be effectively implemented within this value chain. The approach also considers risk, utilizing the SCOR model to identify and mitigate it.

At the end of the design improvement process, the output likely includes some alternatives that require evaluation to determine their acceptance in terms of margin and price. In terms of business recommendation, it will analyse short-term, mid-term, and long-term strategy implementation.

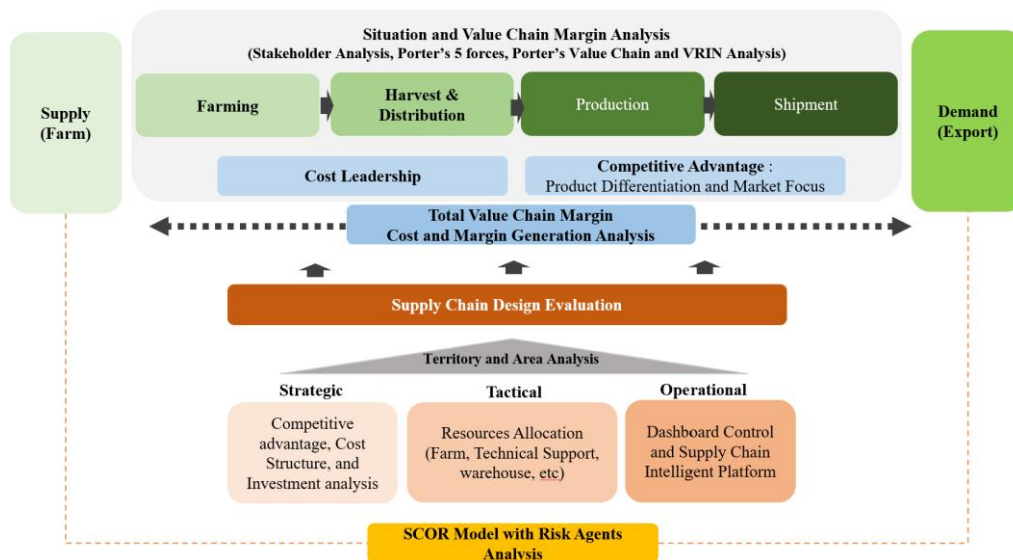


Figure 1: Conceptual Framework

III. RESEARCH METODOLOGY

3.1 Research Flow

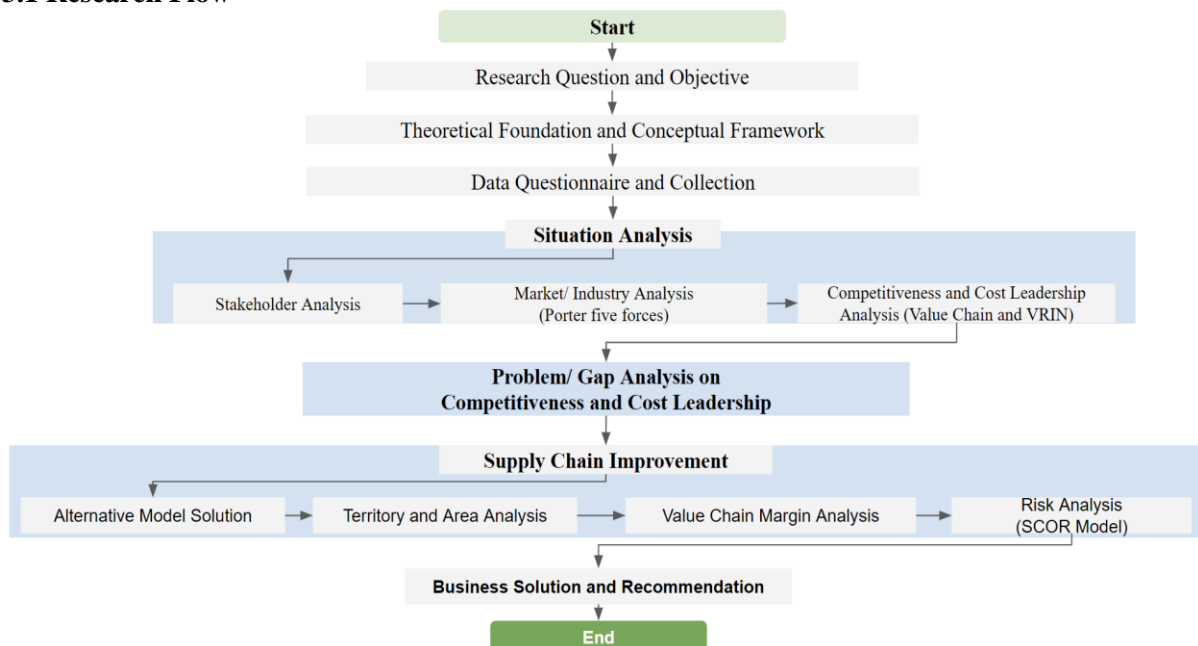


Figure 2 : Research Flow

The research design was carried out through seven stages showed in the flow in figure 1:

1. The flow begins with clear research question an objective
2. The Theoretical and conceptual frameworks can refer in figure 1
3. Based on the theoretical framework, data collection is built with a qualitative approach using the delphi method. The method involves using an expert interview and getting feedback when the conclusion about the question has been reached.
4. The main stage of analysis on this research begins with situational analysis. This stage divided into three points of analysis:
 - a. Stakeholder analysis
This analysis examines the opportunities and problems associated with triple bottom line responsibility (economic, environmental, and social) for each stakeholder involved in the context of shrimp export.
 - b. Market/ industry analysis
The analysis will be conducted using the Porter Five Forces framework. The input comes from an expert interview who assessed the current industry situation using five aspects (barrier to entry, bargaining power of the buyer, bargaining power of the supplier, rivalry among players, and threat of substitute products). The output of the assessment is to determine whether this industry or market is favourable or not.
 - c. Competitiveness and cost leadership analysis
The analysis will be conducted utilizing value chain and VRIN analysis methodologies. The methodology commences by identifying crucial success factors across the value chain through expert interviews and employing benchmarking techniques to compare current condition with that of its competitors. The determined crucial success factor is further analysed using VRIN questions to see whether it qualifies as a competitive advantage. When doing a cost leadership analysis, the approach involves examining the cost structure within the value chain that has a significant impact on overall costs. Subsequently, provide detailed information regarding the underlying reason and future prospects for cost reduction through an interview with an expert. The suggestions will be carefully studied in order to implement enhancements to the supply chain.
5. The situational analysis provides insights into the specific gap that needs to address in order to achieve competitive advantage and cost leadership within the value chain.
6. Once a comprehensive understanding of the problem has been obtained, the next course of action is to devise a solution to enhance the efficiency of the supply chain. There are four steps to provide our solution:
 - a. Developing alternate solutions to address the deficiencies within the supply chain.
 - b. Territory and area analysis using network optimization model framework to assess the current region situation and determine feasibility of implementation.
 - c. Conducting a comprehensive study of the total value chain margin to assess the estimated price and margin for enhancing the supply chain proposal. The result is the level of competitiveness in terms of pricing and the improvement in profit margin.
 - d. The risk analysis is constructed based on the supply chain references operation risk (SCOR) model and a mitigation strategy is developed in accordance with the proposed supply chain improvement.
7. The final step involves creating a comprehensive business solution that includes of timeline and concern for implementation. This section also proposes following recommendation for further research.

3.2 Data Collection Method

The data from primary resources conduct with delphi method with expert interview. This method starts with a predetermined list of themes and possible key questions that elaborate from conceptual framework. Expert interviews conduct with online face to face interview. The data result will be screened, elaborated, and summarize. The result then comeback to respondent to get feedback and confirmation. The confidential data will screen and filter at the end process.

The secondary data and information are conducted from company, book, reports, journal, and publication. There is some key aspect that need to elaborate on data collection process:

1. Industry and market situation
2. Key success factor assessment within value chain that contribute to competitive advantage
3. Business process, product SKU, and territory area
4. Cost identification, opportunity to reducing cost, and opportunity to gain margin.
5. Possibility of integration (e.g. joint operation, joint venture, or any form of integrity model)
6. Technology and digitalization that's support sustainability operation
7. The risk and current mitigation practice procedure

3.3 Data Analysis Method

Generally, the method for analysing interviews is the thematic analysis approach. To enhance the validity of the findings, they are further corroborated by a secondary data verification process, which involves cross-referencing with sources such as corporate reports, journals, publications, and so on.

Tabel 2. Data Analysis Method

Analysis	Method
Stakeholder	Using triple bottom responsibility point of view, opportunity and challenge elaboration.
Industry/ Market Attractiveness	Using likert scale rating (1-10) for each question and calculated for each aspect Porter’s five forces.
Competitive advantage	Using weighted score for each key success factor
Cost structure	Percentage contribution evaluation
Territorial Analysis	Area analysis based on current geographical situation of island in Indonesia, tactical strategy, and operational support analysis to support current business situation.
Risk	Identified by SCOR model and interview

IV. RESULT AND ANALYSIS

4.1 Stakeholder Analysis

Overall, the notable summarize are:

1. The strategy collaboration between company with all stakeholders is mandatory to achieve expansion of export shrimp business
2. Collaboration with farmers in terms of certification, sustainability farming approach, reducing risk and cost is crucial part to securing supply and having quality of raw materials.
3. Double intension for input vendor that probably to be competitor. Defensive strategy is needed with objective stability of market share and margin.
4. Harvest and logistic partner are crucial part to build quality of freshness product, so it need more training and development to achieve new standard procedure.
5. Still need collaboration with middleman to secure market share with financing scheme and build channel for low quality product that absorb to general trade market like wet market in surrounding area supply/ farm.
6. Government collaboration in terms of implementation sustainable farming that reduce mangrove deforestation and improvement regulation (e.g for lab development).

4.2 Industry / Market Assessment

Table 3. Five Forces Industry / Market Assessment

Overall Industry Rating	High (-)	Low (-)	Remarks
Threats of New Entrants – Barriers to entry	-17	15	High barriers to entry
Bargaining Power of Buyers	-11	13	Less bargaining power of buyers
Threats of Substitute	-3	0	High threats of substitute
Bargaining Power of Supplier	-9	12	Low bargaining power of supplier
Determinant of Rivalry Among Existing Competitors	-10	11	Low competitiveness of rivaly among player
Grand Total	-50	51	Favorable to enter the industry

According to Porter’s five forces assessment summary in table 14, the shrimp export industry still attractive and favorable to enter. There is some analysis:

1. US shrimp demand 2016-2021 is increase with 7.1% of CAGR (rabobank.com, 2022). In 2023 to 2030, the US shrimp market had a market size volume of 71.64 billion USD. The market size is projected to see a compound annual growth rate (CAGR) of 5.50% from 2024 to 2030, resulting estimate revenue forecast by 104.59 billion USD in 2030 (grandviewresearch.com, 2023).
2. Indonesian market positioning currently still has room for improvement and penetrate. Generally, current product category of shrimp are shell-on frozen, peeled frozen, shrimp breaded frozen, cooked and meals. For US market, Indonesia currently dominant in the large size (<15, 15/20 pcs/lbs) of shell-on frozen and shrimp

breaded frozen. India positions their market on mid-size shell-on frozen and peeled frozen. Ecuador focus on mid to small shell-on frozen product (shrimpinsight.com, 2022).

3. There is a high barrier to entry situation for exporter that cause from some aspect:
 - a. Incumbent have cost advantage. Player from India and Ecuador have economies of scale to face competitiveness on pricing. Those competitors have less supply chain cost supporting from their geographical area production of shrimp from farm to processor.
 - b. Strong shrimp brand preferences from Ecuador. Shrimp from Ecuador have strong brand perception with tasty, healthy, and sustainable especially for mid to small size of shell-on frozen product.
 - c. High capital expenditure requirement.
 - d. Regulation like US anti dumping policy to protect their local farmers.Although the force situation high, there is some opportunity that might give opportunity to enter the industry. The first is the technology or patent restriction is less and can adopt fast. The second, Indonesia market share is still in good position (big three) and the distribution channel still have room to build both for existing channel and new-owning channel.
4. Buyer do not have significant bargaining power in this industry. The number of buyers still larger than the player or no dominant player (market share <10%) in this industry. The price is sensitive, however switching cost is cheaper and buyer easy to change their preference. The standard requirement relatively is same and regulated. Buyer strict to the product information and healthiness, however the procedure is common and no blocker for producer to pass the regulation.
5. Substitutes pose a significant threat to the seafood industry. Generally, the seafood industry has another substitute product, like salmon, crabs, and lobster. The substitute product also has high CAGR (>10%) even the market size below the shrimp (rabobank.com, 2022). Buyers are highly sensitive to prices. When substituted, the product has a good price. Then they will switch. There is no barrier for buyers to switch products.
6. The supplier's power is limited. The industry has standardized input materials such as labor, raw materials, and chemicals. Generally, this industry comprises a large number of suppliers like farmers and middlemen, also known as tengkulak. So, the company could quickly and cheaply switch between suppliers.
7. There is relative low competition between incumbent players. In the level of country, Indonesian production shrimp supply is number three and have bargain position in the market. The industry also has good market growth and still room for Indonesian player to take market share especially for premium product like big size of HLSO, HOSO, P&D, value added, and breaded product.

4.3 Competitive Advantage

There are seven critical success factors that build up company competitive advantage:

1. Upstream business integration, means business expansion in input business and farming
2. Farm certification, company should have export certification or permit
3. Farming efficiency / technical support, company build technical and laboratory support to reduce risk.
4. Traceability information, company have supply chain intelligent system that tracking all information along supply chain.
5. Before 10 hours SLA from farm to processor that make sure quality of freshness product
6. Downstream integration, company have distribution channel in US
7. Price, company have system to prevent volatility price impacted to contract decision in term of price competitiveness and profitability.

4.4 Cost Structure

It was evident that several expenses played a significant role but could potentially be optimized:

1. Raw material cost

The contribution of raw material is around 50%-60% for large size, 45%-55% for medium size, and 40%-50% for little size. It will increase to 75%-80% depend on SKU product that contributed from yield calculation. With that contribution, raw material also sensitive in terms of price. When raw material price increase, it also increases the finished good product in significant. Initiative to reduce raw material costs significantly could achieved through backward integration, which involves further involvement with businesses in the upstream supply chain. Some companies expand their operations by acquiring shrimp production ponds or engaging in corporate action, such as investing in existing large ponds. This offers two benefits, first securing supply and the second is reducing costs, using profits from shrimp farming to subsidize raw material expenses. According to interviews with experts, some companies even implement backward integration to fulfill 30% of their production requirements. Owning or building a shrimp farm through the integration model has a drawback of requiring a large initial capital investment. Additionally,

there is a high level of risk involved due to the cultivation risk being solely borne by the company. While investment models in established shrimp farms are preferable, they are still not easily expandable and still come with high investment costs. One potential model worth considering is contract farming, which offers significant scalability, a relatively lower risk profile, and requires less initial investment capital or sharing investment capital with another funder.

2. Manufacturing cost.

The second largest cost contributor is the manufacturing costs, which include certification fees. This is due to the company's current lack of its own production and certification factory. Currently, the company is using makloon to produce export products. The contribution to manufacturing costs and certification fees ranges from 14% to 19%. There are four initiatives to reduce manufacturing costs. The first is establishing a proprietary factory, the second is taking corporate action by investing in an operational company, the third is leasing or purchasing a factory with a lease scheme, and the last is creating a hub with 50% process completion capability, particularly in areas with limited affordable processing options.

3. Distributor margin

Outside the cost of goods sold structure, there are a cost that significant contribute to the customer price competitiveness, it is distributor margin. The distributor margin divided into import trader/ broker margin, it around 10% and retailer margin that contribute 30% of cost margin.

4.5 Supply Chain Gap/ Problem

Table 4 identify of supply chain gap both in the competitive advantage and cost structure.

Table 4 Supply Chain Gap/ Problem

Value Chain	Problem	Gap Category	Contribution/ Impact
Upstream (Farming)	High Raw material cost	Cost reduction	Contribution to 40-60% of COGS
	Low upstream business integration	Cost reduction and Competitive advantage	Low margin generation and securing supply
	Do not have farm certification	Competitive advantage	Mandatory clausal for export
	Low Traceability information	Competitive advantage	Do not have supply chain intelligent
	Low Farming efficiency / Productivity support	Cost reduction and Competitive advantage	High risk of cultivation
Midstream (Distribution & Processing)	> 10 hours SLA distribution	Competitive advantage	Bad quality of product
	High manufacturing cost (include processor certification)	Cost reduction	Contribution to 14 -19% of total COGS
Downstream	Price volatility of demand	Competitive advantage	Raw material floating cost
	Do not have downstream integration	Cost reduction and Competitive advantage	Contribution to 30% margin retailer

4.6 Supply Chain Improvement Solution

There is proposed improvement solution for each stage of the supply chain starting from upstream, midstream, and downstream. The illustration of end-to-end supply chain describe in the figure 3.

A. Upstream integration to get backward margin with some following strategic actions:

- 1. Input company contract volume to get margin improvement.** Feed contributes to 50-60% of cultivation costs and is a product with high sales potential in the upstream business. Currently the company gets around 6% margin in feed sales by collaborating through principals. This can be developed if the company can carry

out direct order to factory contracts. Consequently, the company needs to increase the volume of its feed business. The margin that can be increased with a model contract like this is up to 12%, an increase of around 6% from normal conditions. The increased margin can be used as a cross subsidy to reduce raw material costs indirectly. Apart from feed, sales of other input products can also be developed, such as the sale of shrimp seeds with a potential margin of 10%, from the normal around 5%, by entering into volume contracts and developing nursery systems.

2. **Contract farming scheme to make sure end-to-end connectivity and quality of cultivations.** Volume contracts with feed factories certainly require market security regarding feed absorption by farmers. A contract farming system can be developed with several advantages, there are security of feed sales, assurance that shrimp can meet the export needs of raw material processing, and better shrimp quality than non-contract farming systems. The contract farming system is an input financing system with a farming process approach where credit payments are made at harvest. To maintain quality and reduce the risk of crop failure, this system also provides routine monitoring and technical support. Using appropriate proprietary technology such as automatic feeders and water quality monitoring systems helps increase productivity. The harvest is also purchased at the prevailing prices, which prevents the system of bondage and the use of prices that are unprofitable for the farmer. This system distinguishes agricultural contracts from middleman approach models. With the contract farming model, margin generation from the upstream side of the business can be scaled up and connected to export needs, even though not all farms are eligible and feasible.
3. **Build company own-farm with SLA to processor or hub less than 10 hours.** Reducing material costs and certification needs can be met at the same time by creating shrimp farms that are operated independently by the company or by entering a joint venture with existing farms. The scheme offered is an investment to support farm certification as well as the implementation of SOPs and technology that guarantees productivity and cost efficiency. This development has consequences in terms of investment and the team's capability to executions. To aim that the investment spent also supports the quality of the raw material being distributed, the location of farm needs to be integrated with a hub or processor location that is feasible for delivery in under 10 hours.
4. **Build technology and technical support system to reduce risk and improve productivity.** In order to develop sustainable farming, the use of technology continues to be developed in stages in reducing cultivation risks, especially the spread of disease. It is necessary to develop a disease prediction system that become an early warning system for farmers and funders. In addition, water quality monitoring and sampling of shrimp conditions are carried out to ensure that shrimp are in a cultivation environment that is optimum to growth. It make sure increasing productivity. Apart from on-site technology, superior seeds and effective feed are also developed. All this implementation aims to build continues of cultivation sustainability. In terms of volatility price, it needs prediction technology that predict demand price and connecting to raw material price that give information both potential profit or loss on that situations. The platform can use for contract decision making both to the buyer or to the farmers. Mostly, the profitability/ loss projection come out for mid to long term contract decision.

B. Midstream cost efficiency with some following strategic actions:

1. **Move strategic partnership scheme from makloon to lease scheme.** The high manufacturing costs are caused by the makloon process, where the company does not have the capability to process shrimp into finished good. In the short term, this pattern can be used especially to meet market demand in the initial penetration phase. However, as time goes by, the makloon process can be transitioned into a lease scheme. It means company lease all facility (land, plant building, machinery, and all supporting facilities) and take over all production operation process. This is to ensure the production process and quality are within the company's control. Apart from that, with rent the production costs are cheaper. The rental scheme is also a solution so that current processors do not lose production capacity or become idle. In this way, development investment can be avoided in the short or medium term.
2. **Build own factory.** Several major companies in the seafood industry engage in forward integration. An example is Sandhya Aqua, who hails from India. The company commenced shrimp farming operations in 2005 and then diversified its activities by creating a processing unit in 2008. The processing units of exceptional quality are strategically positioned in close proximity to their shrimp farms. The company operates in three divisions, each equipped with eight individually quick frozen (IQF) production lines, four cooking lines, and six plate freezers. This allows them to process a total of 50,000 metric tons per year. According to the recommended approach, it was proposed that the corporation establish a shrimp processing facility. Implementing this will significantly save production expenses and enhance quality control, while also ensuring the essential certification, such as HACCP.
3. **Build hub or mini plant in area that uncover 10 hours SLA distribution.** In locations like Sumbawa, Lombok and Bali, where there are potential premium shrimp producers but the nearest processor is in East

Java, it is necessary to find a solution that ensures the distribution system supports the production of premium shrimps and guarantees a distribution time of less than 10 hours according to the Service Level Agreement (SLA). An effective approach would be to construct a central facility or a small-scale plant dedicated to conducting cryogenic freezing or pre-processing operations, such as headless processing. It can be concluded that there will be a cost reduction of Rp 1000 on the premium grade standard of shrimp.

C. Downstream integration to get forward margin distribution

Following Sandhya Aqua strategy to enhance the value chain margin, they possess a family-owned company that engages in seafood importation in the US through AZ Gems, in Europe through Bonmea, and in Canada through Select Source. The U.S. firm is the second largest importer of frozen shrimp in the USA and has contributed to India's emergence as one of the leading global exporters of shrimp. Companies can use tactics for forward integration to acquire potential distribution or retail profit, often ranging from 30-40%.

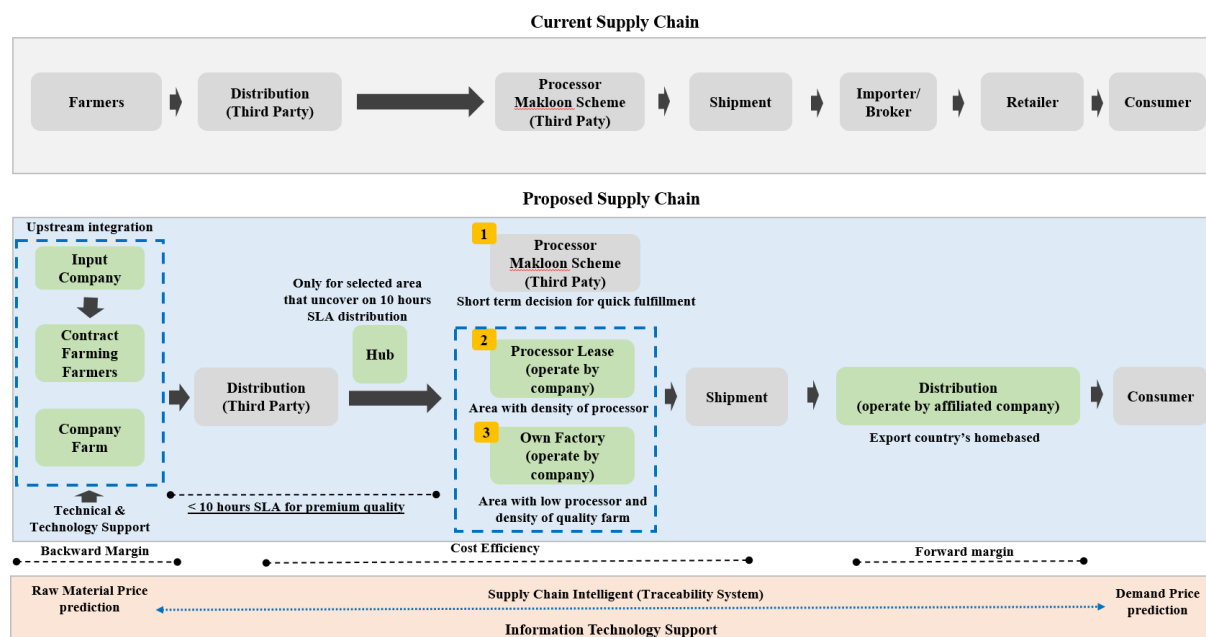


Figure 3 Supply Chain Improvement Solution

All initiatives improvements could apply with some scenario based on area condition. The only mandatory criteria design is own-farm area would better be integrating with own-facility or lease-processing scheme. It because hub/ pre-processing plant just only for special area case that impossible to direct distribution from farm to processor. Placing them in an incorrect location will increase the overall cost of the supply chain and not effective. Elaborating all initiative improvements, at least there is four scenario supply chain identified:

1. **Scenario 1:** CF farmers network – productivity improvement program – Hub / mini plant – main processor (lease scheme) – company affiliated in downstream – Costumer.
2. **Scenario 2:** CF farmers network – productivity improvement program – main processor (lease scheme) – company affiliated in downstream – Costumer.
3. **Scenario 3:** Own farm (dominant) & CF farmers network – productivity improvement program – main processor (lease scheme) – company affiliated in downstream – Costumer.
4. **Scenario 4:** Own farm (dominant) & CF farmers network – productivity improvement program – own processor – company affiliated in downstream – Costumer.

4.7 Value Chain margin Improvement

The cost reduction calculation is performed using the cumulative percentage approach on the value chain, specifically focusing on the consumer price gap for the medium-sized product Raw HLSO. Scenario 4 demonstrates the most optimal choice for achieving a cost reduction of 35%, while scenario 3 ranks second with a cost reduction of 32%. Scenario 2, which offers a 22% cost reduction, is the third priority. Scenario 1, with a 21% cost reduction, is the last priority. Implementing a decision for each scenario in a linear manner, considering the required investment cost. The greater the cost reduction, the greater the investment required. The decision to implement the scenario is contingent upon the specific requirements of the location and the target market segment for the product. Not every scenario will fulfil the product requirements. The primary parameter that needs to be

controlled is the price differential between the price at which the customer purchases and the pricing the customer expects or the market price. For instance, both supply chain scenario 1 and scenario 2 are unable to deliver the product Raw HLISO in medium and small sizes in October due to the price disparity above 22%. The disparity in prices is greater than the reductions in costs. To prevent this circumstance, the idea is to create a price prediction platform that can accurately compute the gap and facilitate better decision-making.

The total margin estimate is conducted by considering the possible enhancement resulting from both backward integration and forward integration strategies. The supply chain scenario for value chain margin is mostly influenced by scenarios 4, which result in a significant 22% boost in margin. Scenario 3 comes in the second priority with 19% margin improvement. The significant driver for margin generation is strategy to build own farming and building own processing.

Table 5 Cost Reduction and Value Chain Margin Improvement for Each Supply Chain Scenario

Value Chain	Alternatives Supply Chain	Current*)	Alternative Improvement Scenario			
			Scenario 1	Scenario 2	Scenario 3	Scenario 4
Upstream	Farming	55,18%				
	Contract farming (with input contract volume)		-5,40%	-5,40%		
	Own-farm (SLA less than 10-hours to processor)				-15%	-15%
	Productivity improvement from technology and Technical support		-6,18%	-6,18%	-6,18%	-6,18%
Midstream	Harvest and distribution	58,89%				
	Makloon	93,60%				
	Hub/Mini plant		-4,62%			
	Lease scheme of processing			-5,60%	-5,60%	
Downstream	Own-processor factory					-8,40%
	Export Shipment	100%				
	Margin production	105%				
	Importer/ broker	116%				
	Retailer	150%				
	Downstream integration (Afiliated company)		-5%	-5%	-5%	-5%
Cost	Raw Material	55,18%	44%	44%	34%	34%
	Manufacturing Cost	93,60%	77%	76%	67%	64%
	Cost of Good Sold	100%	84%	83%	73%	70%
	Retailer/ownstream distributor margin	116%	99%	98%	89%	86%
	Consumer buying price	150%	129%	128%	118%	116%
	Cost reduction		21%	22%	32%	35%
Margin Improvement Potency	Upstream Margin	6%	18%	18%	27%	27%
	Midstream Margin	5%	10%	11%	11%	13%
	Downstream Margin		5%	5%	5%	5%
	Total margin	11%	32%	33%	43%	46%
	Current gap		24%	24%	24%	24%
	Margin Improvements		8%	9%	19%	22%

*) The cost reduction calculation is performed using the cumulative percentage approach on the value chain.

4.8 Risk Analysis

According to risk priority in the previous research at aquaculture supply chain in Vietnam (Thuy, Chau, Phong, Tham, 2023), there are 14 risk events identified that potentially coming along the supply chain. However, the chain analysis only until the midstream process. In this analysis, that approach will be elaborated with current company case and proposed supply chain design from upstream business to downstream business.

Table 6 Risks Analysis

Aspect	Risk	Causes of Risk	Recommended Mitigation Actions
Upstream			
Input Contract volume	Sales volume drop	Competition; Spread of diseases on farm; Unfavorable off-taking price;	pricing strategy; volume & margin negotiation;
	Depending to one supplier	Area limited/ exclusive partnership	Area based partnership (exclusive in certain area coverage)

Aspect	Risk	Causes of Risk	Recommended Mitigation Actions
	Poor quality of material	Lack of quality control during receiving and distribution; lack of inventory control	Implement TQM system; strictly metric on quality control
Contract Farming (Financing)	Bad debt and Non-Performing Loan (NPL)	Miss match KYC assessment. Failure of cultivation; Fraud	Combine banking and cultivation approach; Improve governance and internal control
Cultivation	High mortality	Diseases;	Diseases prediction and treatment system
Cultivation	Low average daily of growth	low water quality control; ineffective feed management	Water quality and feed monitoring system
	Low of harvest shrimp quality/ does not match standard, sell at low price	low water quality control; spread of diseases; Manpower shortage/ skill	Implement cultivation technology (water quality control, diseases prediction, and consultation process)
Midstream			
Off takings	Bad harvest process	Bad harvest SOP; shortage manpower skill	Screening harvest partner; strictly briefing before harvest
	unfair weight calculation	Weak control process during weighting	Strictly control with digital assistance tools
First mile Distributions	Decreasing quality of shrimp	Wrong treatment during transportation	Improve SOP; implement digital monitoring
	Truck incident	Low maintenance and truck feasibility check	Strictly road certificate control
Processing	Low quality of product	Weak quality control; manpower shortage skill	SOP improvement and control; training
	Low yield	manpower shortage skill; manual process	SOP improvement and control; training; automation process
	High inventory	Demand shortage; volatility of price / shortage price	Improve supply-demand furcating; price prediction control
Downstream			
Shipments	Late of shipment	Does not match compliance	Improve readiness checking before ship
Last mile distribution	Decreasing quality of product	Low maintenance/ lack of maintenance during distribution process e.g decreasing/ unstable temperature control	Improving SOP control; automation control with digital temperature monitoring

V. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The study conclusion is the crystallization of the results to answer the research questions as business solution, there are:

1. The export market is still favorable based on this study, however company need strategy to face the challenge of high barrier to entry to enter the market and competitiveness.
2. There are 7 aspects influenced the competitive advantage and margin generation: upstream strategy integration, export license certification, cultivation technical support, digitalization of supply chain and traceability, delivery of fresh shrimp within 10 hours, downstream integration strategy, and anticipation of price volatility.

3. There are three high contribution cost structures in the supply chain: the cost of acquiring raw materials, the cost of manufacturing, and the potential margin loss in downstream distribution.
4. The proposed supply chain scenario resulting cost reduction at 21-35% and margin improvement from 8-22% from the current basis issue of price. The scenario 4 give highest cost reduction and margin contribution with 35% and 22% respectively.
5. There are 16 risks identified along the value chain and recommended mitigation action proposal as describes in table 6.

5.2 Recommendation

There are some recommendations can be followed for the further study and implementation:

1. The study of market positioning and product development for each country destination
2. Feasibility study and impact investment for own facility need to build such as own-farm, hub, and own-processing plant.
3. Detailing research on supply chain intelligent platform especially to build robust system for transaction process, cultivation data enhancement, price prediction system and traceability.

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